SECTION 6-12, NOISE BARRIER WALLS
April 5, 2004

6-12.1 Description

This work consists of constructing cast-in-place concrete, precast concrete, masonry, and timber noise barrier walls, including those shown in the Standard Plans.

6-12.2 Materials

Materials shall meet the requirements of the following sections:

Cement	9-01
Aggregates for Portland Cement Concrete	9-03.1
Gravel Backfill	9-03.12
Premolded Joint Filler	9-04.1(2)
Bolts, Nuts, and Washers	9-06.5(1)
Steel Reinforcing Bar	9-07.2
Epoxy-Coated Steel Reinforcing Bar	9-07.3
Paints	9-08
Concrete Curing Materials and Admixtures	9-23
Fly Ash	9-23.9
Water	9-25

Other materials required shall be as specified in the Special Provisions.

6-12.3 Construction Requirements

6-12.3(1) Submittals

All noise barrier walls not constructed immediately adjacent to the roadway, and which require construction of access for work activities, shall have a noise barrier wall access plan. The Contractor shall submit the noise barrier wall access plan to the Engineer for approval in accordance with Section 6-01.9. The noise barrier wall access plan shall include, but not be limited to, the locations of access to the noise barrier wall construction sites, and the method, materials, and equipment used to construct the access, remove the access, and recontour and reseed the disturbed ground.

For construction of all noise barrier walls with shafts, the Contractor shall submit a shaft construction plan to the Engineer for approval in accordance with Section 6-01.9, including but not limited to the following information:

1. List and description of equipment to be used to excavate and construct the shafts, including description of how the equipment is appropriate for use in the expected subsurface conditions.

2. The construction sequence and order of shaft construction.

3. Details of shaft excavation methods, including methods to clean the shaft excavation.

4. Details and dimensions of the shaft, and casing if used.

5. The method used to prevent ground caving (temporary casing, slurry, or other means).

6. Details of concrete placement including procedures for deposit through a conduit, tremie, or pump.

7. Method and equipment used to install and support the steel reinforcing bar cage.

For construction of precast concrete noise barrier walls, the Contractor shall submit shop drawings for the precast concrete panels to the Engineer in accordance with Section 6-02.3(28)A. In addition to the items listed in Section 6-02.3(28)A, the precast concrete panel shop drawings shall include the following:

1. Construction sequence and method of forming the panels.

2. Details of additional reinforcement provided at lifting and support locations.

3. Method and equipment used to support the panels during storage, transporting, and erection.

4. Erection sequence, including the method of lifting the panels, placing and adjusting the panels to proper alignment and grade, and supporting the panels during bolting, grouting, and backfilling operations.

The Contractor shall not begin noise barrier wall construction activities, including access construction and precast concrete panel fabrication, until receiving the Engineer's approval of all appropriate and applicable submittals.

6-12.3(2) Work Access and Site Preparation

The Contractor shall construct work access in accordance with the work access plan as approved by the Engineer. The construction access roads shall minimize disturbance to the existing vegetation, especially trees. Only trees and shrubs in direct conflict with the approved construction access road alignment shall be removed. Only one access road into the noise barrier wall from the main roadway and one access road from the noise barrier wall to the main roadway shall be constructed at each noise barrier wall.

Existing vegetation that has been identified by the Engineer shall be protected in accordance with Sections 1-07.16 and 2-01, and the Special Provisions.

6-12.3(3) Shaft Construction

The Contractor shall excavate and construct the shafts in accordance with the shaft construction plan as approved by the Engineer.

The shafts shall be excavated to the required depth as shown in the Plans. The excavation shall be completed in a continuous operation using equipment capable of excavating through the type of material expected to be encountered.

If the shaft excavation is stopped, the Contractor shall secure the shaft by installing a safety cover over the opening. The Contractor shall ensure the safety of the shaft and surrounding soil and the stability of the side walls. A temporary casing, slurry, or other methods approved by the Engineer shall be used as necessary to ensure such safety and stability.

When caving conditions are encountered, the Contractor shall stop further excavation until implementing the method to prevent ground caving as specified in the shaft construction plan approved by the Engineer.

When obstructions are encountered, the Contractor shall notify the Engineer promptly. An obstruction is defined as a specific object (including, but not limited to, boulders, logs, and man made objects) encountered during the shaft excavation operation which prevents or hinders the advance of the shaft excavation. When efforts to advance past the obstruction to the design shaft tip elevation result in the rate of advance of the shaft drilling equipment being is significantly reduced relative to the rate of advance for the rest of the shaft excavation, then the Contractor shall remove the obstruction under the provisions of Section 6-12.5 as supplemented in the Special Provisions. The method of removal of such obstructions, and the continuation of excavation shall be as proposed by the Contractor and approved by the Engineer.

The Contractor shall use appropriate means to clean the bottom of the excavation of all shafts. No more than two inches of loose or disturbed material shall be present at the bottom of the shaft just prior to beginning concrete placement.

The Contractor shall not begin placing steel reinforcing bars and concrete in the shaft until receiving the Engineer's approval of the shaft excavation.

The steel reinforcing bar cage shall be rigidly braced to retain its configuration during handling and construction. The Contractor shall not place individual or loose bars. The Contractor shall install the steel reinforcing bar cage as specified in the shaft construction plan as approved by the Engineer. The Contractor shall maintain the minimum concrete cover shown in the Plans.

If casings are used, the Contractor shall remove the casing during concrete placement. A minimum five feet head of concrete shall be maintained to balance soil and water pressure at the bottom of the casing. The casing shall be smooth. Where the top of the shaft is above the existing ground, the Contractor shall case the top of the hole prior to placing the concrete.

Concrete for shafts shall conform to Class 4000P. The Contractor shall place concrete in the shaft immediately after completing the shaft excavation and receiving the Engineer's approval of the excavation. The Contractor shall place the concrete in one continuous operation to the elevation shown in the Plans, using a method to prevent segregation of aggregates. The Contractor shall place the concrete as specified in the approved shaft construction plan. If water is present, concrete shall be placed in accordance with Section 6-02.3(6)B.

6-12.3(4) Trench, Grade Beam, or Spread Footing Construction

Where the noise barrier wall foundations exist below the existing groundline, excavation shall conform to Section 2-09.3(4), and to the limits and construction stages shown in the Plans. Foundation soils found to be unsuitable shall be removed and replaced in accordance with Section 2-09.3(1)C.

Where the noise barrier wall foundations exist above the existing groundline, the Contractor shall place and compact backfill material in accordance with Section 2-03.3(14)C.

Concrete for trench, grade beam, or spread footing foundations shall conform to Class 4000.

Cast-in-place concrete shall be formed, placed, and cured in accordance with Section 6-02, except that concrete for trench foundations shall be placed against undisturbed soil.

The excavation shall be backfilled in accordance with item 1 of the **Compaction** subsection of Section 2-09.3(1)E.

The steel reinforcing bar cage and the noise barrier wall anchor bolts shall be installed and rigidly braced prior to grade beam and spread footing concrete placement to retain their configuration during concrete placement. The Contractor shall not place individual or loose steel reinforcing bars and anchor bolts, and shall not install anchor bolts during or after concrete placement.

6-12.3(5) Cast-In-Place Concrete Panel Construction

Construction of cast-in-place concrete panels for noise barrier walls shall conform to Section 6-11.3(4). For noise barrier walls with traffic barrier, the construction of the traffic barrier shall also conform to Section 6-10.3(2).

The top of the cast-in-place concrete panels shall conform to the top of wall profile shown in the Plans. Where a vertical step is constructed to provide elevation change between adjacent panels, the dimension of the step shall be 2 feet. Each horizontal run between steps shall be a minimum of 48 feet.

6-12.3(6) Precast Concrete Panel Fabrication and Erection

The Contractor shall fabricate and erect the precast concrete panels in accordance with Section 6-02.3(28), and the following requirements:

1. Concrete shall conform to Class 4000.

2. Except as otherwise noted in the Plans and Special Provisions, all concrete surfaces shall receive a Class 2 finish in accordance with Section 6-02.3(14)B.

3. The precast concrete panels shall be cast in accordance with Section 6-02.3(28)B. The Contractor shall cast the precast concrete panels horizontally, with the traffic side surface cast against the form liner on the bottom. The Contractor shall fully support the precast concrete panel to avoid bowing and sagging surfaces.

   After receiving the Engineer's approval of the shop drawings, the Contractor shall cast one precast concrete panel to be used as the sample panel. The Contractor shall construct the sample panel in accordance with the procedure and details specified in the shop drawings approved by the Engineer. The Contractor shall make the sample panel available to the Engineer for approval.

   Upon receiving the Engineer's approval of the sample panel, the Contractor shall continue production of precast concrete panels for the noise barrier wall. All precast concrete panels will be evaluated against the sample panel for the quality of workmanship exhibited. The sample panel shall be retained at the fabrication site until all precast concrete panels have been fabricated and have received the Engineer's approval. After completing precast concrete panel fabrication, the Contractor may utilize the sample panel as a production noise barrier wall panel.

4. In addition to the fabrication tolerance requirements of Section 6-02.3(28)F, the precast concrete panels for noise barrier walls shall not exceed the following scalar tolerances:

   Length and Width: ± 1/8 inch per five feet, not to exceed 1/4 inch total.

   Thickness: ± 1/4 inch.

   The difference obtained by comparing the measurement of the diagonal of the face of the panels shall not be greater than 1/2 inch.

   Dimension tolerances for the traffic barrier portion of precast concrete panels formed with traffic barrier shapes shall conform to Section 6-10.3(2).

5. After erection, the precast concrete panels shall not exceed the joint space tolerances shown in the Plans. The panels shall not exceed 3/8 inch out of plumb in any direction.

   The Contractor shall seal the joints between precast concrete panels with a backer rod and sealant system as specified. The Contractor shall seal both sides of the joint full length.

The top of precast concrete panels shall conform to the top of wall profile shown in the Plans. Where a vertical step is constructed to provide elevation change between adjacent panels, the dimension of the step shall be 2 feet. Each horizontal run between steps shall be a minimum of 48 feet.

6-12.3(7) Masonry Wall Construction

Construction requirements for masonry noise barrier wall panels shall be as specified in the Special Provisions.

6-12.3(8) Fabricating and Erecting Timber Noise Barrier Wall Panels

Construction requirements for timber noise barrier wall panels shall be as specified in the Special Provisions.

6-12.3(9) Access Doors and Concrete Landing Pads

The Contractor shall install access doors and door frames as shown in the Plans and Standard Plans. The Contractor shall install the access doors to open toward the roadway side. The door frames shall be set in place with grout conforming to Section 6-02.3(20), with the grout completely filling the void between the door frame and the noise barrier wall panel.

The Contractor shall apply two coats of paint, as specified in the Special Provisions, to all exposed metal surfaces of access doors and frames, except for stainless steel surfaces. Each coat shall be 3 mils minimum wet film thickness.

The Contractor shall construct a concrete landing pad on the roadway side of each access door location as shown in the Plans. The concrete shall conform to Section 6-02.3(2)B.

6-12.3(10) Finish Ground Line Dressing

The Contractor shall contour and dress the ground line on both sides of the noise barrier wall, providing the minimum cover over the foundation as shown in the Plans. The

Contractor shall contour the ground adjacent to the barrier to ensure good drainage away from the barrier.

After the access roads are no longer needed for noise barrier wall construction activities, the Contractor shall restore the area to the original condition. The Contractor shall recontour the access roads to match into the surrounding ground and shall reseed all disturbed areas in accordance with the Section 8-01 and the Special Provisions, and the noise barrier wall access plan as approved by the Engineer.

6-12.4 Measurement

Noise barrier wall will be measured by the square foot area of one face of the completed wall panel in place. Except as otherwise noted, the bottom limit for measurement will be the top of the trench footing, spread footing, or shaft cap. For Noise Barrier Type 5, the bottom measurement limit will be the optional construction joint at the base of the traffic barrier. For Noise Barrier Type 7, the bottom measurement limit will be base of the traffic barrier. For Noise Barrier Types 8, 11, 12, 14, 15, and 20, the bottom measurement limit will be the base of the wall panel.

Noise barrier wall access door will be measured once for each access door assembly with concrete landing pad furnished and installed.

6-12.5 Payment

Payment will be made in accordance with Section 1-04.1 for each of the following bid items when they are included in the proposal:

"Noise Barrier Wall Type __", per square foot.
The unit contract price per square foot for "Noise Barrier Wall Type __" shall be full pay for constructing the noise barrier walls as specified, including constructing and removing access roads, excavating and constructing foundations and grade beams, constructing cast-in-place concrete, and masonry wall panels, fabricating and erecting precast concrete, and timber wall panels, applying sealer, and contouring the finish ground line adjacent to the noise barrier walls.

"Noise Barrier Wall Access Door", per each.
The unit contract price per each for "Noise Barrier Wall Access Door" shall be full pay for furnishing and installing the access door assembly as specified, including painting the installed access door assembly and constructing the concrete landing pad.